

Andreas Colliander

Dr. Andreas Colliander is a Research Scientist in the Water and Carbon Cycles Group of the Science Division. His primary field of research is the development of microwave remote sensing techniques. He is currently focused on NASA's SMAP (Soil Moisture Active and Passive) mission as a member of the science algorithm development team. His work addresses performance and reliability of soil moisture retrieval algorithms utilizing active and passive microwave measurements, and the science product calibration and validation.



In the past Dr. Colliander's research activities have included microwave instrument development related to the European Space Agency's SMOS (Soil Moisture and Ocean Salinity) mission (he was the Lead Developer of the Reference Radiometer onboard the satellite), studies on synthetic aperture interferometric radiometry concepts, and investigations of polarimetric radiometry and its applications. Dr. Colliander is a Senior Member of the IEEE, and serves as a co-lead of the Microwave Radiometer Working Group of the IEEE Geoscience and Remote Sensing Society.

Education

- Ph.D., Electrical Engineering, Helsinki University of Technology (2007)
- M.S., Electrical Engineering, Helsinki University of Technology (2002)

Research interests

Microwave remote sensing techniques, especially for hydrology applications.

Projects

SMAP - Soil Moisture Active & Passive

SMAP will provide global measurements of soil moisture and its freeze/thaw state.

Professional Experience

- Jet Propulsion Laboratory, California Institute of Technology (2008 - Present)
 - Research Scientist, Water and Carbon Cycles Group
- European Space Agency, Postdoctoral Research Fellow, European Space and Technology Research Centre (2007-2008)
- Helsinki University of Technology, Research Scientist and Project Manager, Laboratory of Space Technology (2001-2007)

Peer-Reviewed Publications

1. **Colliander, A.**, Martin-Neira, M., Closa, J., Benito, J., "Pre-Launch Estimation of Radiometric Resolution and Stability of SMOS Zero-Baseline Radiometer in Anechoic Chamber", *IEEE Transactions on Geoscience and Remote Sensing*, vol. 48, no. 3, March 2010.
2. Kainulainen, J., Lemmetyinen, J., Rautiainen, K., **Colliander, A.**, Uusitalo, J., Lahtinen, J., "Error Propagation in Calibration Networks of Synthetic Aperture Radiometers", *IEEE Transactions on Geoscience and Remote Sensing*, vol. 47, no. 9, September 2009.
3. **Colliander, A.**, Corbella, I., Torres, F., "Correlation Denormalization in Interferometric or Polarimetric Radiometers: A Unified Approach", *IEEE Transactions on Geoscience and Remote Sensing*, vol. 47, no. 2, pp. 561-568, February 2009.
4. Brown, M., Corbella, I., Torres, F., **Colliander, A.**, "SMOS Calibration", *IEEE Transactions on Geoscience and Remote Sensing*, vol. 46, no. 3, pp. 646-658, March 2008.
5. **Colliander, A.**, Ylä-Oijala, P., "Electromagnetic Scattering from Rough Surface Using Single Integral Equation and Adaptive Integral Method", *IEEE Transactions on Antennas and Propagation*, vol. 55, no. 12, pp. 3639-3646, December 2007
6. Lemmetyinen, J., Uusitalo, J., Kainulainen, J., Rautiainen, K., Fabritius, N., Levander, M., Kangas, V., Greus, H., Pihlflyckt, J., Kontu, A., Kempainen, S., **Colliander, A.**, Hallikainen, M.T., Lahtinen, J., "SMOS Calibration Subsystem", *IEEE Transactions on Geoscience and Remote Sensing*, vol. 45, no. 11, pp. 3691-3700, November 2007
7. **Colliander, A.**, Ruokokoski, L., Suomela, J., Veijola, K., Kettunen, J., Kangas, V., Aalto, A., Levander, A., Greus, H., Hallikainen, M., Lahtinen, J., "Development and Calibration of SMOS Reference Radiometer", *IEEE Transactions on Geoscience and Remote Sensing*, vol. 45, no. 7, pp. 1967-1977, July 2007
8. **Colliander, A.**, Lahtinen, J., Tauriainen, S., Pihlflyckt, J., Lemmetyinen, J., Hallikainen, M., "Sensitivity of Airborne 36.5-GHz Polarimetric Radiometer's Wind-Speed Measurement to Incidence Angle", *IEEE Transactions on Geoscience and Remote Sensing*, vol. 45, no. 7, pp. 2122-2129, July 2007.
9. **Colliander, A.**, Kettunen, J., Hallikainen, M. T., "Calibration of End-to-end Phase Imbalance of Polarimetric Radiometers", *IEEE Transactions on Geoscience and Remote Sensing*, vol. 44, no. 10, pp. 2635-2641, Oct. 2006.
10. Corbella, I., Torres, F., Camps, A., Duffo, N., Vall-Ilossera, M., Rautiainen, K., Martín-Neira, M., **Colliander, A.**, "Analysis of Correlation and Total Power Radiometer Front-Ends Using Noise Waves", *IEEE Transactions on Geoscience and Remote Sensing*, vol. 43, no. 11, pp. 2452-2459, Nov 2005.
11. **Colliander, A.**, Tauriainen, S., Auer, T., Kainulainen, J., Uusitalo, J., Toikka, M., Hallikainen, M., "MIRAS Reference Radiometer: A Fully Polarimetric Noise Injection Radiometer", *IEEE Transactions on Geoscience and Remote Sensing*, vol. 43, no. 5, pp. 1135-1143, May 2005.
12. Corbella, I., Torres, F., Camps, A., **Colliander, A.**, Martín-Neira, M., Ribó, S., Rautiainen, K., Duffo, N., Vall-Ilossera, M., "MIRAS End-to-End Calibration. Application to SMOS L1 Processor", *IEEE Transactions on Geoscience and Remote Sensing*, vol. 43, no. 5, pp. 1126-1134, May 2005.

Articles in International Conference Proceedings

1. **Colliander, A.**, S. Chan, S. Yueh, M. Cosh, R. Bindlish, T. Jackson, E. Njoku, "Utilization of Airborne and In Situ Data Obtained in SGP99, SMEX02, CLASIC and SMAPVEX08 Field Campaigns for SMAP Soil Moisture Algorithm Development and Validation", MicroRad 2010 - 11th Specialist Meeting on Microwave Radiometry and Remote Sensing for the Environment, Washington D.C, USA, March 1-4, 2010.
2. Kainulainen, J., **Colliander, A.**, "In-orbit performance of the SMOS reference radiometers - results from the early commissioning phase", MicroRad 2010 - 11th Specialist Meeting on Microwave Radiometry and Remote Sensing for the Environment, Washington D.C, USA, March 1-4, 2010.
3. **Colliander, A.**, Martin-Neira, M., Closa, J., Benito, J., "Satellite radiometer pre-launch sensitivity estimation using anechoic chamber and channel inter-comparison", IEEE International Geoscience and Remote Sensing Symposium IGARSS 2009, Cape Town, South-Africa, July 12-17, 2009.
4. Kangas, V., **Colliander, A.**, "Receiver as a Radiometer Calibration Target", IEEE International Geoscience and Remote Sensing Symposium IGARSS 2009, Cape Town, South-Africa, July 12-17, 2009.
5. Kangas, V., **Colliander, A.**, "Use of Receiver as a Calibration Target", Microwave Technology and Techniques Workshop 2008, ESA/ESTEC, Noordwijk, The Netherlands, May 5-6, 2008.
6. **Colliander, A.**, de Maagt, P., Närhi, T., "Polarimetric Interferometric Radiometers: Analysis of Front-end Non-idealities", MicroRad 2008 - 10th Specialist Meeting on Microwave Radiometry and Remote Sensing for the Environment, Florence, Italy, March 11-14, 2008
7. **Colliander, A.**, Lemmetyinen, J., Uusitalo, J., Suomela, J., Veijola, K., Kontu, A., Kempainen, S., Pihlflyckt, J., Rautiainen, K., Hallikainen, M., Lahtinen, J., "Ground Calibration of SMOS: NIR and CAS", IEEE International Geoscience and Remote Sensing Symposium IGARSS 2007, Barcelona, Spain, July 23-27, 2007
8. Christensen, J., Carlström, A., Ekström, H., Emrich, A., Embretsen, J., de Maagt, P., **Colliander, A.**, "GAS: the Geostationary Atmospheric Sounder", IEEE International Geoscience and Remote Sensing Symposium IGARSS 2007, Barcelona, Spain, July 23-27, 2007
9. Kempainen, S., Lemmetyinen, J., Auer, T., **Colliander, A.**, Aalto, A., Rautiainen, K., Hallikainen, M., "Thermal Stabilized Front-end PCB with Active Cold Calibration Load for L-band Radiometer", IEEE International Geoscience and Remote Sensing Symposium IGARSS 2007, Barcelona, Spain, July 23-27, 2007
10. Lahtinen, J., Piironen, P., **Colliander, A.**, Martin-Neira, M., "Improved Receiver Architecture for Future L-Band Radiometer Missions", IEEE International Geoscience and Remote Sensing Symposium IGARSS 2007, Barcelona, Spain, July 23-27, 2007
11. **Colliander, A.**, Ruokokoski, L., Suomela, J., Veijola, K., Kettunen, J., Kangas, V., Levander, M., Greus, H., Hallikainen, M., Lahtinen, J., "Reference Radiometer of SMOS: Development and Calibration", IEEE International Geoscience and Remote Sensing Symposium IGARSS 2006, Denver, Colorado, USA, July 31-August 4, 2006
12. **Colliander, A.**, Suomela, J., Veijola, K., Kettunen, J., Ruokokoski, L., Kangas, V., Lahtinen, J., Hallikainen, M., "Ground Calibration of Flight Models of Reference Radiometer of MIRAS", MicroRad 2006 - 9th Specialist Meeting on Microwave Radiometry and Remote Sensing for the Environment, San Juan, Puerto Rico, February 28-March 3, 2006
13. **Colliander, A.**, Suomela, J., Ruokokoski, L., Kangas, V., Aalto, A., Lahtinen, J., Hallikainen, M., "Temperature Variation Compensation in Engineering Model of MIRAS

Reference Radiometer" , IEEE International Geoscience and Remote Sensing Symposium IGARSS 2005, Seoul, South-Korea, July 25-29, 2005

14. **Colliander, A.**, Lahtinen, J., Tauriainen, S., Pihlflyckt, J., Lemmetyinen, J., Hallikainen, M., "Airborne Ocean Wind Vector Measurement using 36.5 GHz Profiling Polarimetric Radiometer", IEEE International Geoscience and Remote Sensing Symposium IGARSS 2005, Seoul, South-Korea, July 25-29, 2005
15. Kettunen, J., **Colliander, A.**, Hallikainen, M., "Linearly Polarized Antenna Load for Calibration of End-to-End Phase Difference of Polarimetric Radiometer Receivers", IEEE International Geoscience and Remote Sensing Symposium IGARSS 2005, Seoul, South-Korea, July 25-29, 2005
16. Lahtinen, J., Ruokokoski, L., **Colliander, A.**, Kangas, V., Aalto, A., Levander, M., Greus, H., "Reference Radiometer for Interferometric Radiometry from Space", IEEE International Geoscience and Remote Sensing Symposium IGARSS 2005, Seoul, South-Korea, July 25-29, 2005
17. **Colliander, A.**, Tauriainen, S., Auer, T., Uusitalo, J., Toikka, M., Hallikainen, M., "Evaluation of In-orbit Temperature Variation on Performance of MIRAS Prototype Noise Injection Radiometer", IEEE International Geoscience and Remote Sensing Symposium IGARSS 2004, Anchorage, Alaska, USA, September 20-24, 2004
18. **Colliander, A.**, Ylä-Oijala, P., Pulliainen, J., "Electromagnetic Scattering from Ocean Surface Using Single Integral Equation and Adaptive Integral Method", IEEE International Geoscience and Remote Sensing Symposium IGARSS 2004, Anchorage, Alaska, USA, September 20-24, 2004
19. Corbella, I., Torres, F., Camps, A., Duffo N., Vall-Ilossera M, Rautiainen, K., **Colliander, A.**, "Systematic Noise Analysis of a Correlation Radiometer Front-End", IEEE International Geoscience and Remote Sensing Symposium IGARSS 2004, Anchorage, Alaska, USA, September 20-24, 2004
20. **Colliander, A.**, Tauriainen, S., Auer, T., Kainulainen, J., Uusitalo, J., Toikka, M., Hallikainen, M., "Calibration of Fully Polarimetric Noise Injection Radiometer of MIRAS", MicroRad 2004 - 8th Specialist Meeting on Microwave Radiometry and Remote Sensing for the Environment, Rome, Italy, February 24-27, 2004
21. **Colliander, A.**, Tauriainen, S., Auer, T., Kainulainen, J., Uusitalo, J., Toikka, M., Hallikainen, M., "Development and Characterisation of Fully Polarimetric Noise Injection Radiometer for MIRAS", IEEE International Geoscience and Remote Sensing Symposium IGARSS 2003, Toulouse, France, July 21-25 2003